at least one whispering gallery mode optical wave resonator disposed in coupling relation to the spatial mode of the wave transmission member, and positioned to couple wave power from and to the member; and

at least one control means, each in operative relationship to a different one of the at least one resonators, for varying round trip loss of the respective resonator such that the optical wave transmitted in the wave transmission member is varied in power level.

2. An optical power control device as set forth in claim 1 above, wherein the control means is coupled to the resonator and absorbs optical wave power from the resonator

3. An optical wave power control device as set forth in claim 2 above

wherein the resonator and member introduce losses such that the resonator is overcoupled and the loss induced by the control means attains critical coupling,

4. An optical wave power control device as set forth in claim 1 above,

wherein the loss per round trip of recirculating modes at the resonant frequency is maintained in a critical coupling regime.

5. An optical power control device as set forth in claim 1 above, wherein the resonator comprises a member having an approximately equatorial periphery with a diameter of less than about 1000 microns disposed in a position relative to the wave power transmission member to couple with wave power in the member and circulate resonant modes equatorially.

6. An optical power control device as set forth in claim 5 above, where the resonator has a Q that is selected in accordance with the desired wavelength and bandwidth of the transmission that is being modified.

7. An optical power control device as set forth in claim 5 above where the frequency separation of resonator modes is selected in accordance with the spectral extent spanned by the frequencies propagating in the member.

8. :An optical power control device as set forth in claim 7 above wherein the resonator mode frequency separation is greater than 200 GHz.

9. An optical power control device as set forth in claim 6 above, where the resonator circumferential periphery diametral dimension is less than about 100 microns and has a Q of the order of 20,000 in the 1550nm telecommunications band.

10. An optical power control device as set forth in claim 1 above, wherein the transmission member is a planar waveguide and the resonator is a disc, a ring, or a closed loop.

11. An optical power control device as set forth in claim 1 above, wherein the transmission member is an optical fiber with a narrowed length and the resonator is a microsphere in close juxtaposition to the narrowed length of the fiber.

12. An optical power control device as set forth in claim 1 above, wherein the transmission member is an optical fiber with a narrowed length and the resonator is selected from the class comprising discs, rings and oblate spheroids in close juxtaposition to the narrowed length of the fiber..

13. An optical power control device as set forth in claim 1 above, wherein the device comprises a modulator responsive to a given optical frequency.

14. An optical power control device as set forth in claim 1 above, wherein the device comprises a switch responsive to a given optical frequency.

15. A control device as set forth in claim 1 above, wherein at least one control means comprises a semiconductor element in coupling proximity to the

resonator and responsive to a control signal for variably absorbing wave power circulating about the resonator.

16. A control device as set forth in claim 15 above, wherein the semiconductor element comprises a multi-layer photonic element of at least one layer of quantum well material insulated by barrier layers and responsive to applied signals to vary in absorption characteristics.

17. A control device as set forth in claim 1 above, wherein the at least one control means comprises a semiconductor in contact with or near the resonator, and means for illuminating the semiconductor to change the absorption and the loss.

18. A control device as set forth in claim 1 above, wherein the at least one control means comprises a semiconductor in contact with or near the resonator, and means for applying a controllable electrical field to the semiconductor to change the absorption and the loss.

19. A control device as set forth in claim 1 above, wherein the control means for varying the power coupled into the resonator comprises means for varying the refractive index of the resonator to shift the frequency of the resonance modes of the resonator to modulate the transmitted power.

20. A control device as set forth in claim 19 above, wherein the means for varying the refractive index comprises nonlinear optical means at the resonator and means for irradiating the resonator to vary the resonator refractive index.

21. A control device as set forth in claim 19 above, wherein the means for varying the refractive index comprises material on the resonator whose refractive index varies with an electric field, and means for applying a varying electric field to the material to modify the refractive index and frequencies of the resonant modes of the resonator.

22. A control device as set forth in claim 1 above, wherein the power transmitted is varied monotonically between limits to modulate the transmitted wave power with data at a selected data rate.

23. A control device as set forth in claim 22 above, wherein the frequency separation between the resonator modes is selected in accordance with the spectral extent spanned by the frequencies propagating in the member.

24. A control device as set forth in claim 22 above, wherein the Q of the resonator is established at a level determined by the wavelength and data rate/signal bandwidth of the modulating signal.

25. A control device as set forth in claim 22 above, wherein the resonator has a Q of the order of 20,000 in the 1550nm telecommunications band, the resonator has a diameter of less than 100 microns, and the modulating signal has a data rate of the order of 10Gigabits per second.

26. A control device as set forth in claim 1 above, wherein the optical wave transmission member propagates a number of different frequencies and wherein the device includes a plurality of resonators, each resonant at a different one of the propagated frequencies and in coupling relation to the wave transmission member, and a plurality of control means, each disposed in relation to a different one of the resonators and controlling the resonator round trip loss thereat so as to vary power transmission at a selected frequency.

27. A control device as set forth in claim 26 above, wherein the wave transmission member comprises an optical fiber waveguide having a coupling length of small diameter such that wave energy is propagated in part outside the fiber surface, and a plurality of resonators disposed along the coupling length in coupling relation to the member, each having resonant modes at a different one of the propagated frequencies.

28. A control device as set forth in claim 26 above, wherein the wave transmission member comprises a planar waveguide having a coupling

length of small diameter such that wave energy is propagated in part outside the waveguide surface, and a plurality of resonators disposed along the coupling length in coupling relation to the member, each having resonant modes at a different one of the propagated frequencies.

29. An optical power control device in accordance with claim 1 above, wherein the control means introduces loss variations between substantially full and substantially zero transmission such that at least one optical frequency is switched on and off.

30. An optical power control device in accordance with claim 1 above, wherein the wave transmission member propagates a number of different frequencies in a wavelength division multiplexed mode, wherein the device includes multiple resonators, each resonant at a different frequency, and wherein the control means selectively switches (i.e., blocks or admits) frequencies out of the multiplexed signals by varying transmission at each resonator.

31. An optical power control device in accordance with claim 1 above, wherein a plurality of resonators and associated control means are disposed inline with the wave transmission member, each resonator and associated control means comprising a modulator operating at a different optical frequency in a set of optical frequencies, and further including a plurality of laser sources that are in —line in the wave transmission member and transmitting different

frequencies of the set in a downstream direction on the transmission member, and in which the modulator for each given frequency is downstream of the laser source for that frequency.

32. An optical power control device in accordance with claim 31 above, wherein the lasers and modulators alternate on the transmission member.

33. An optical power control device in accordance with claim 31 above, wherein the wave transmission member comprises an optical fiber waveguide and wherein the lasers comprise fiber lasers such as fiber DFB lasers.

34. An optical power control device in accordance with claim 33 wherein the device further includes optical pump means for the lasers coupled into the transmission member.

35. An optical power control device in accordance with claim 1 above, wherein the wave transmission member comprises a single optical waveguide having a predetermined length in which there is an external field distribution, and wherein the at least one resonator comprises a number of resonators each responsive to a different frequency and each disposed along the predetermined length, and wherein the control means comprises a plurality of round trip loss varying controls, each operable with a different one of the resonators.

36. An optical wave power control device as set forth in claim 1 above, and further comprising a second wave transmission member in coupling relation to the resonator.

37. An optical wave power control device as set forth in claim 36 above, wherein the wave transmission members are optical fibers each including a taper region with a narrow waist in coupling relation to the resonator and the resonator comprises a microsphere, oblate spheroid, disc, or ring.

38. An optical wave power control device as set forth in claim 36 above, wherein the wave transmission members are planar optical waveguides each including a taper region with a narrow waist in coupling relation to the resonator and the resonator comprises a microsphere, oblate spheroid, disc, or ring.

39. An optical wave power control device as set forth in claim 36 above, wherein the two transmission members couple to substantially the same resonator modes, and where the resonator round trip loss associated with resonator to transmission member couplings establishes near critical coupling between these resonator modes and each transmission member.

40. An optical power control device as set forth in claim 39 above, including means for varying the loss by varying the absorption of the resonator mode.

41. An optical power control device as set forth in claim 39 above, wherein the means for varying absorption comprises a semiconductor that is varied by applying an electric field or voltage applied to the semiconductor.

42. An optical power control device as set forth in claim 39 above, wherein the means for varying absorption comprises a semiconductor that is varied by photo pumping the semiconductor.

43. An optical power control device as set forth in claim 39 above, wherein the means for varying absorption comprises by a semiconductor that is varied by an injection current to the semiconductor.

44. An optical power control device as set forth in claim 39 above, wherein the means for varying absorption comprises by a quantum well semiconductor structure that is varied by applying an electric field or voltage to the semiconductor.

45. An optical power control device as set forth in claim 39 above, wherein the means for varying absorption comprises by a quantum well semiconductor structure that is varied by photo pumping the semiconductor.

46. An optical power control device as set forth in claim 39 above, wherein the means for varying absorption comprises a quantum well semiconductor structure that is varied by an injection current to the semiconductor.

47. An optical power control device as set forth in claim 1 above, wherein the device includes a second member in association with the resonator and the means for varying the power level comprises means for varying the coupling of resonator mode power into the second member.

48. An optical power control device as set forth in 47 above, wherein the second member is a waveguide and the means for varying the power coupling includes means for varying the phase matching of the waveguide relative to the resonator mode.

49. An optical power control device as set forth in 47 above, wherein the waveguide is comprises an electrooptic material and phase matching is varied by applying a voltage to the waveguide.

50. An optical power control device as set forth in 47 above, wherein the waveguide comprises an optically nonlinear material and phase matching is varied by optical means.

51. An optical power control device as set forth in claim 47 above, wherein the at least one control means comprises means for varying a property that is the component of round-trip resonator loss associated with the resonator to member coupling, with other sources of resonator round-trip loss being substantially fixed.

52. An optical power control device as set forth in claim 51 above, wherein the loss is varied by varying the resonator-to-member coupling amplitude κ'.

53. An optical power control device as set forth in claim 52 above, wherein the coupling amplitude is varied by electrooptic means.

54. An optical power control device as set forth in claim 52 above, wherein the coupling amplitude is varied by optical means.

55. An optical power control device as set forth in claim 51 above, wherein the device includes means for varying the optical path length of at least one resonator mode.

56. An optical power control device as set forth in claim 55 above, wherein the means for varying optical path length comprises means for varying the dielectric constant of the medium or media comprising the resonator.

57. An optical power control device as set forth in claim 56 above, wherein the means for varying dielectric constant comprises means for application of an electric field.

58. An optical power control device as set forth in claim 55 above, wherein the means for varying dielectric constant comprises means for application of an optical wave.

59. An optical power control device as set forth in claim 55 above, wherein the means for varying dielectric constant comprises means for application of an applied electrical current.

60. An optical power control device as set forth in claim 55 above, wherein the means for varying dielectric constant comprises thermal means associated with the resonator.

61. An optical power control device as set forth in claim 51 above, wherein the device comprises means for varying the component of round-trip negative resonator loss (optical gain) separately from the resonator loss associated with the member couplings.

62. An optical power control device as set forth in claim 61 above, wherein the resonator comprises means for providing optical gain.

63. An optical power control device as set forth in 61 above, wherein the optical gain induces over coupling.

64. An optical power control device as set forth in 47 above wherein the loss associated with the control means induces under coupling.

65. An optical power control device as set forth in claim 1 above, wherein the at least one resonator comprises at least two resonators, each resonant at a like frequency and each disposed at a different quadrant about the length of the wave transmission member.

66. An optical power control device at set forth in claim 65 above, wherein the wave transmission is of arbitrary polarization and the resonators have equatorial surfaces within which WGM modes circulate, the equatorial surfaces being in planes orthogonally disposed relative to each other, and the wave transmission member comprising a tapered fiber.

67. An optical power control device, comprising:

a continuous length of optical wave power propagating member characterized by guided wave evanescent fields extending outside the member for a portion of the member;

at least one high Q optical wave recirculating device having a peripheral surface within the evanescent field of the member and exchanging wave power therewith, and

a wave power control in association with the at least one recirculating device for varying the wave power returned to the wave power propagating member from the resonator.

68. A control device as set forth in claim 67 above, wherein the recirculating device is a member of the class of wave power resonators characterized as whispering gallery mode devices and comprising spheres, discs, rings, oblongs, ellipses and polygons, and wherein the wave power propagating member is of the class comprising optical fiber waveguides.

69. A control device as set forth in claim 67 above, wherein the recirculating device is a member of the class of wave power resonators characterized as whispering gallery mode devices and comprising spheres, discs, rings, oblongs, ellipses and polygons, and wherein the wave power propagating member is of the class comprising planar optical waveguides.

70. A control device as set forth in claim 67 above, wherein the wave power control varies the returned wave power between the recirculating device and the propagating member either from overcoupled to critically coupled or from critically coupled to undercoupled conditions.

71. An optical wave transmission control for in-line variation of power transmission on an optical waveguide, comprising:

a low loss optical wave power recirculating device having a periphery adjacent to the optical waveguide in a relation to couple wave power therefrom, the recirculating device also returning wave power to the optical waveguide, and

a variable coupling device operating with the recirculating device for varying the power returned to the optical waveguide from the recirculating device to vary power transmission on the optical waveguide without introducing discontinuities into the waveguide.

72. An optical wave transmission control as set forth in claim 71 above, wherein the variable coupling device introduces losses per recirculation round trip to either establish critical coupling of a previously overcoupled resonator or establish undercoupling of a previously critically coupled resonator.

73. An optical wave transmission control as set forth in claim 72 above, wherein the variable coupling device interacts with the recirculating wave to absorb a portion of the recirculating wave energy per round trip.

74. An optical wave transmission control as set forth in claim 71 above, wherein the variable coupling device alters the refractive index of the wave recirculating device to change its resonant frequency and hence vary transmission on the optical waveguide.

75. The method of modifying the power level of a mono-wavelength signal in an optical waveguide comprising the steps of:

transferring a part of the power transmitted along the waveguide into a whispering gallery mode resonant at the transmitted wavelength; and

returning power to the optical waveguide from the whispering gallery mode;

introducing a controllable loss in the power of the whispering gallery mode to modify the power level in the transmitted signal in the waveguide.

76. A method as set forth in claim 75 above, wherein the intrinsic losses in transferring power and in whispering gallery mode operation are insufficient to extinguish the waveguide power level and the controllable loss is varied in a range greater than the intrinsic losses.

77. A method as set forth in claim 76 above, wherein the introduced controllable loss is varied between a critical coupling level wherein the waveguide transmitted power is at a minimum and a level at which the waveguide transmitted power is substantially unattenuated.

78. A method as set forth in claim 75 above, including the added steps of:

distributing a portion of the electromagnetic power outside the waveguide;

coupling the power outside the waveguide into the whispering gallery mode; and

effecting the controllable loss while coupling power from the whispering gallery mode back to the waveguide.

79. A method as set forth in claim 78 above, wherein the waveguide transmitted power is non-polarized and wherein the step of introducing the controllable loss includes establishing at least two whispering gallery modes in which

power circulates in planes that are orthogonally disposed relative to each other.

80. A method of modulating or switching light at a single wavelength along a continuous optical waveguide comprising the steps of:

propagating a guided part of the optical power along but outside the waveguide;

transferring a portion of the power that is outside the waveguide into a high Q recirculating path in which a portion emanates outwardly from the recirculating path;

returning power from the recirculating path to the optical waveguide; and

introducing loss to the recirculating power in controlled fashion to modulate the power propagated along the waveguide.

81. A method as set forth in claim 80 above, wherein the power is propagated outside the waveguide by the step of changing the waveguide cross section, and wherein the power propagated along the waveguide is attenuated over 90% from unity value by establishing a critical coupling loss in the power in the recirculating path.

82. A method as set forth in claim 81 above, further including the steps of limiting power in the recirculating path to modes resonant at one or more frequencies and building up recirculating power at the resonant modes.

83. The method of modulating optical power within an optical waveguide comprising the steps of:

coupling at least some transmitted power from the waveguide into at least one recirculating wave power path resonant at at least one frequency,

coupling recirculating power back to the optical waveguide, and

absorbing a controlled amount of power from the at least one recirculating path to modulate optical power transmission along the waveguide.

84. A method as set forth in claim 83 above, wherein the optical power transmitted comprises a single wavelength signal and wherein the step of recirculating is resonant at that wavelength.

85. A method as set forth in claim 83 above, wherein the optical power transmission comprises at least two different wavelength signals and the step of absorbing power from the at least one recirculating path comprises absorbing power from the different wavelengths.

86. A signal amplitude modifier for use at optical wavelengths comprising;

a waveguide for conducting optical power, the waveguide including at least a segment in which propagated power is partially distributed adjacent the waveguide;

a low loss, optical power recirculating device disposed to couple a portion of the power distributed adjacent the waveguide into the

device for cumulative recirculation therein, the recirculating device generating an external field coupling power propagated therewithin back to the waveguide; and

loss control means disposed in association with the recirculating power device for absorbing the power during recirculation to modify the amplitude of the optical power propagated along the waveguide.

87. The invention as set forth in claim 86 above, wherein the recirculating power device comprises a whispering gallery mode element having a selected in accordance with signal wavelength and bandwidth.

88. The invention as set forth in claim 86 above, wherein the recirculating power device comprises a whispering gallery mode element having a Q in excess of 1,000, resonant at a selected frequency.

89. The invention as set forth in claim 88 above, wherein the whispering gallery mode element comprises a dielectric microcavity selected from the class comprising microspheres, oblate spheroids, discs, and rings.

90. The invention as set forth in claim 89 above, wherein the whispering gallery mode device comprises a microsphere, ring or disc of a diameter less than 1000 microns and the waveguide comprises an optical fiber having a narrow waist region, the microsphere being attached to the waist region.

91. The invention as set forth in claim 89 above, wherein the optical fiber which has a reduced diameter waist region of no greater than about 10 microns and tapered transition sections integral therewith joining to the optical fiber waveguide at each end, and the microsphere has a diameter of the order of 30 microns.

92. The invention as set forth in claim 86 above, wherein the input optical power is not necessarily polarized, including at least two optical power recirculating devices disposed adjacent the waveguide segment, in interchange relation with power distributed about the segment, and each being in power interchange relation with the loss control means, such that modification of optical power in the waveguide is independent of polarization.

93. The invention as set forth in claim 86 above, wherein the amplitude modifier includes a number of wave power recirculating devices, each disposed along the wave distributing segment of the waveguide in power interchange relation with the distributed field thereabout, and each responsive to a different wavelength signal.

94. A modulator for use with an optical fiber transmission system, comprising:

an optical fiber having a narrow waist providing exterior waveguided power thereabout, the wave power having a selected nominal frequency;

an optical resonator disposed in close proximity to the waist in communication with the exterior waveguided energy, the resonator being configured to be resonant and to generate internal recirculating modes at the selected nominal frequency and the communication with the waist including power return to the fiber, and

loss control means comprising an optical power absorber in communication with the power recirculating in the resonator, for introducing a loss as the modes recirculate to thereby either establish critical coupling of a previously overcoupled resonator or establish undercoupling of a previously critically coupled resonator.

95. A modulator as set forth in claim 94 above, wherein the resonator comprises a whispering gallery mode device comprising an element having an equatorial periphery in which the recirculating energy field is confined with an emanating but guided field distribution outside the periphery.

96. A modulator as set forth in claim 95 above, wherein the resonator comprises a microsphere, oblate spheroid, ring or disc, wherein the loss control means comprises a signal responsive semiconductor element in the emanating field of the recirculating energy, and wherein the Q of the microsphere is determined by sizing the microsphere in accordance with the spectral linewidth required for a data rate to be used in transmission.

97. A modulator as set forth in claim 95 above, wherein the resonator comprises a silica microsphere, wherein the loss control means comprises a signal responsive semiconductor element in the emanating field of the recirculating

energy, and wherein the Q of the microsphere is determined by sizing the microsphere in accordance with the spectral linewidth required for a data rate to be used in transmission.

98. Apparatus for controlling transmission of combinations of a number of different optical frequencies on an optical waveguide comprising:

a waveguide capable of propagating the different frequencies and characterized by a coupling section having field propagation partially outside the surface of the waveguide;

a plurality of whispering gallery mode resonators disposed adjacent the coupling section of the waveguide and coupled thereto, each resonator having a resonant mode at a different one of the optical frequencies and each coupling back to the waveguide, and

a plurality of means, each coupled to a different one of the resonators, for independently varying the loss at the respective resonator to vary signals at that frequency returned to the waveguide such as to separately switch off that frequency on command.

99. Apparatus as set forth in claim 98 above, wherein the resonators have Q values that are selected in accordance with signal frequency, bandwidth and mode frequency separation in accordance with the general spectral extent of the optical frequencies.

100. Apparatus as set forth in claim 98 above, wherein the whispering gallery mode resonators are microspheres.

101. Apparatus as set forth in claim 98 above, wherein the whispering gallery mode resonators are discs, rings, or oblate spheroids.

102. Apparatus as set forth in claim 98 above, wherein the waveguide is an optical fiber which has a reduced diameter waist region. in microns

103. A system for generating and controlling multiple optical signals of different wavelengths on a single optical waveguide capable of propagating multiple wavelengths within a chosen bandwidth, comprising:

an optical waveguide having at least two integral lengths with partially external distributions of guided wave power, the optical waveguide also including at least two in-waveguide optical power sources operating at different wavelengths in the chosen bandwidth;

at least two optical resonators, each being resonant at a different one of the wavelengths in the chosen bandwidth and each being disposed in coupling relation to a different integral length of the optical waveguide and coupled thereto, and

a control system optically coupled to each of the resonators for controlling power loss thereat, whereby propagated power at different wavelengths is separately controlled in the single optical waveguide.

104. A system as set forth in claim 103 above, wherein the optical waveguide is an optical fiber and the at least two integral lengths comprise narrow waist sections having integral tapered transitions to the fiber, and the resonators are internally reflecting volumes of optical material that recirculate optical waves at the individual chosen wavelengths, and have an

edge coupled into the externally distributed portion of the guided wave energy.

105. A system for controlling the amplitude level of optical signals of a chosen wavelength transmitted along a waveguiding element with undefined polarization comprising:

a coupling length of the wave guiding element which is dimensioned and configured to establish a partially exterior distribution of guided wave power;

a pair of resonators of the whispering gallery mode type disposed along the coupling length of the waveguiding element in coupling from and to the exterior distributed wave power, the resonators being orthogonally disposed relative to the propagation axis of the coupling length and resonant at the chosen wavelength, and

loss control means associated with each of the resonators for introducing controllable loss in the wave power recirculated at the resonators, such that the propagated signals are controlled regardless of their polarization.

106. A system as set forth in claim 105 above, wherein the waveguided element is an optical fiber having a narrow section in which waveguiding is maintained partially within and partially adjacent the fiber, and wherein the resonators are volumetric microcavities having equatorial peripheries lying in planes which are radial to the fiber and orthogonal to each other, such that whatever the orientation of the polarization vector the controlled amplitude level is in accordance with the desired controllable loss.

107. A device for modifying the optical wave signals on an optical waveguide system, comprising:

first and second optical waveguides each having an interaction section in which optical waves are guided in part outside the waveguide; the interaction sections being spaced apart and at least one of the waveguides transmitting optical waves at at least one chosen frequency;

a volumetric dielectric microcavity device, operating in a WGM mode and resonant at the chosen frequency, disposed between the interaction sections of the first and second waveguides and having peripheral arcs in coupling relation to the interaction sections of both waveguides; and

variable optical wave power absorber means operating with the microcavity device for varying the power level of the wave circulating in the microcavity device at the chosen frequency.

108. A device as set forth in claim 107 above, wherein the microcavity device has an interactive equatorial recirculation path for power at resonant frequencies and the interaction sections of the first and second waveguides lie in a common plane with the equatorial recirculation path, and wherein the absorber means varies the wave power by introducing loss that varies in a critical coupling range.

109. A device as set forth in claim 108 above, wherein the first and second waveguides are optical fibers and the interaction sections are waist regions integrally formed within the fibers, and the microcavity device is a device selected from the class comprising discs, spheres, rings and oblate spheroids.

110. For an optical system introducing a variable optical power transmission in an optical waveguide adjacent to a whispering gallery mode optical wave recirculator, the improvement in means for controlling the power variation comprising:

a dielectric volumetric resonator for supporting whispering gallery modes at at least one resonant frequency and including energy responsive means for varying the frequency of the at least one resonant mode to vary the transmission.

111. An improvement in controlling means as set forth in claim 110 above wherein the energy responsive means comprises material in association with the dielectric resonator that varies in dielectric constant in response to an external stimulus.

112. An improvement in controlling means as set forth in claim 111 above, wherein the material is a layer on the resonator that is responsive to external excitation, and improvement includes variable control means for externally exciting the layer.

113. An improvement in transmission control as set forth in claim 111 above, wherein the resonator itself is of optically nonlinear material and the improvement includes control means that illuminates the resonator with variable intensity radiation.

114. For an optical system which introduces a variable power transmission in an optical wave transmission member by coupling wave power from a whispering gallery mode device, the improvement in transmitted power control comprising:

a whispering gallery mode resonator responsive to at least one resonant frequency for recirculating optical waves of that frequency within a plane having an equatorial boundary, the resonator operating to provide guided wave power emanating from its periphery,

optical wave power absorber means within the emanating guided wave power from the resonator for absorbing a portion of the recirculating wave power, and

means coupled to the absorber means for varying the level of absorption of recirculating wave power.

115. An improvement in transmitted power control as set forth in claim 114 above, wherein the absorber means comprises a quantum well structure formed from layers of optically active and barrier material and the means for varying the level of absorption provides an electrical signal to the absorber means.

116. An improvement in transmitted power control as set forth in claim 115 above, wherein the absorber means is formed of active layers of InGaAs and the barrier layers are of InGaAsP.

117. An improvement in transmitted power control as set forth in claim 114 above, wherein the absorber means comprises semiconductor materials having selected band gaps related to the energy of the signal wave photon energy and the means for varying the level of absorption comprises means for optically pumping the semiconductor materials.

118. An improvement in transmitted power control as set forth in claim 114 above, wherein the absorber means comprises semiconductor materials having a selected band gap related to the signal wave photon energy and the means for varying the level of absorption comprises means for establishing a variable electrical field at the semiconductor materials.

119. A system for controllably varying the signal transmission in an optical waveguide without transitions in a coupling to the waveguide itself, comprising;

an optical waveguide having an integral coupling section therein in which an exterior portion of waveguided energy emanates into the surrounding environment, the waveguide being selected from the class including optical fibers and optical planar waveguides;

a dielectric optical microcavity member supporting at least one whispering gallery mode internally at at least one resonant frequency, the microcavity member protruding into the emanating waveguided energy and coupling optical waves partially from and back into the waveguide, wherein the microcavity member is selected from the class comprising microspheres, discs and rings of spherical and non-spherical geometry, and

means associated with the microcavity member for introducing loss into the whispering gallery mode and thereby varying the signal transmission in the optical waveguide.

120. An optical wave power control device for varying the transmitted power at at least one optical frequency (i.e., optical carrier wave) on an optical wave power transmission member comprising:

an optical wave transmission member configured for propagating and guiding optical power at at least one optical frequency; and

at least one whispering gallery mode optical wave resonator disposed in coupling relation to the transmission member, positioned to couple wave power from and to the member, and in frequency resonance with a selected optical wave propagating on the transmission member.

at least one control means, each in operative relationship to a different one of the at least one resonators, for varying a property of the respective resonator such that the optical wave transmitted in the wave transmission member is varied in power level.

121. An optical wave power control device as set forth in claim 120 above, wherein the property that is varied is the component of round-trip resonator

loss that is distinct from the resonator loss associated with the member coupling.

122. An optical wave power control device as set forth in claim 121 above, wherein the loss is varied by varying the absorption of the resonator mode.

123. An optical wave power control device as set forth in claim 122 above, wherein the absorption is produced by a semiconductor and varied by applying an electric field or Voltage to the semiconductor.

124. An optical wave power control device as set forth in claim 122 above, wherein the absorption is produced by a semiconductor and varied by photo pumping the semiconductor.

125. An optical wave power control device as set forth in claim 122 above, wherein the absorption is produced by a semiconductor and varied by an injection current to the semiconductor.

126. An optical wave power control device as set forth in claim 122 above, wherein the absorption is produced by a quantum well semiconductor structure and varied by applying an electric field or Voltage to the semiconductor.

127. An optical wave power control device as set forth in claim 122 above, wherein the absorption is produced by a quantum well semiconductor structure and varied by photo pumping the semiconductor.

128. An optical wave power control device as set forth in claim 122 above, wherein the absorption is produced by a quantum well semiconductor structure and varied by an injection current to the semiconductor.

129. An optical wave power control device as set forth in claim 121 above, wherein the loss is varied by varying the coupling of resonator mode power into another member or structure.

130. An optical wave power control device as set forth in 129 above, wherein the structure is a waveguide whose phase matching to the resonator mode is varied to control power coupling.

131. An optical wave power control device as set forth in claim 130 above, wherein the waveguide is composed of an electrooptic material and phase matching is varied by applying a Voltage to the waveguide.

132. An optical wave power control device as set forth in claim 130 above, wherein the waveguide is composed of an optically nonlinear material and phase matching is varied by optical means.

133. An optical wave power control device as set forth in claim 120 above, wherein the property that is varied is the component of round-trip resonator loss associated with the resonator to member coupling and with the other sources of resonator round-trip loss being fixed.

134. An optical wave power control device as set forth in claim 133 above, wherein the loss is varied by varying the resonator-to-member coupling amplitude κ.

135. An optical wave power control device as set forth in claim 134 above, wherein the coupling is varied by electrooptic means.

136. An optical wave power control device as set forth in claim 134 above, wherein the coupling is varied by optical means.

137. An optical wave power control device as set forth in claim 120 above, wherein the property that is varied is the optical path length of the resonator mode or modes.

138. An optical wave power control device as set forth in claim 137 above, wherein the optical path length is varied by varying the dielectric constant of the medium or media comprising the resonator.

139. An optical wave power control device as set forth in claim 138 above, wherein the dielectric constant is varied by application of an electric field.

140. An optical wave power control device as set forth in claim 138 above, wherein the dielectric constant is varied by application of an optical wave.

141. An optical wave power control device as set forth in claim 138 above, wherein the dielectric constant is varied by application of an applied electrical current.

142. An optical wave power control device as set forth in claim 138 above, wherein the dielectric constant is varied by thermal means.

143. An optical wave power control device as set forth in claim 120 above, wherein the property that is varied is the component of round-trip negative resonator loss (optical gain) that is distinct from the resonator loss associated with the member coupling.

144. An optical wave power control device as set forth in claim 143 above, wherein the optical gain is provided by the resonator.

145. An optical wave power control device as set forth in claim 121 above, wherein the resonator and member introduce components of round-trip resonator loss such that the resonator is over-coupled and the loss associated with the control means induces critical coupling.

146. An optical wave power control device as set forth in claim 121 above, wherein the resonator and member introduce components of round-trip resonator loss such that the resonator is critically coupled and the loss associated with the control means induces under coupling.

147. An optical wave power control device as set forth in claim 133 above, wherein the resonator and member introduce components of round-trip resonator loss such that the resonator is over-coupled and the loss associated with control means is varied to induce critical coupling.

148. An optical wave power control device as set forth in claim 133 above, wherein the resonator and member introduce components of round-trip resonator loss such that the resonator is critically coupled and the loss associated with the control means is varied to induce under coupling.

149. An optical wave power control device as set forth in claim 133 above, wherein the resonator and member introduce components of round-trip resonator loss such that the resonator is critically coupled and the optical gain associated with control means induces over coupling.

150. An optical wave power control device as set forth in claim 133 above, wherein the resonator and member introduce components of round-trip resonator loss such that the resonator is under coupled and the optical gain associated with control means induces critical coupling.

151. An optical wave power control device as set forth in claim 120 above, wherein the optical wave transmission member propagates a number of different frequencies and wherein the device includes a plurality of resonators, each resonant at a different one of the propagated frequencies and in coupling relation to the wave transmission member, and a plurality of control means, each disposed in relation to a different one of the resonators and controlling a property of the resonator thereat so as to vary power transmission at a selected frequency.

152. An optical power control device in accordance with claim 120 above, wherein a plurality of resonators and associated control means are disposed inline with the wave transmission member, each resonator and associated control means comprising a modulator operating at a different optical

frequency in a set of optical frequencies, and further including a plurality of laser sources that are in —line in the wave transmission member and transmitting different frequencies of the set in a downstream direction on the transmission member, and in which the modulator for each given frequency is downstream of the laser source for that frequency.

153. An optical wave power control device as set forth in claim 120 above, wherein the wave transmission member is an optical fiber and coupling to the at least one whispering gallery mode optical wave resonator occurs at a tapered region of the fiber.